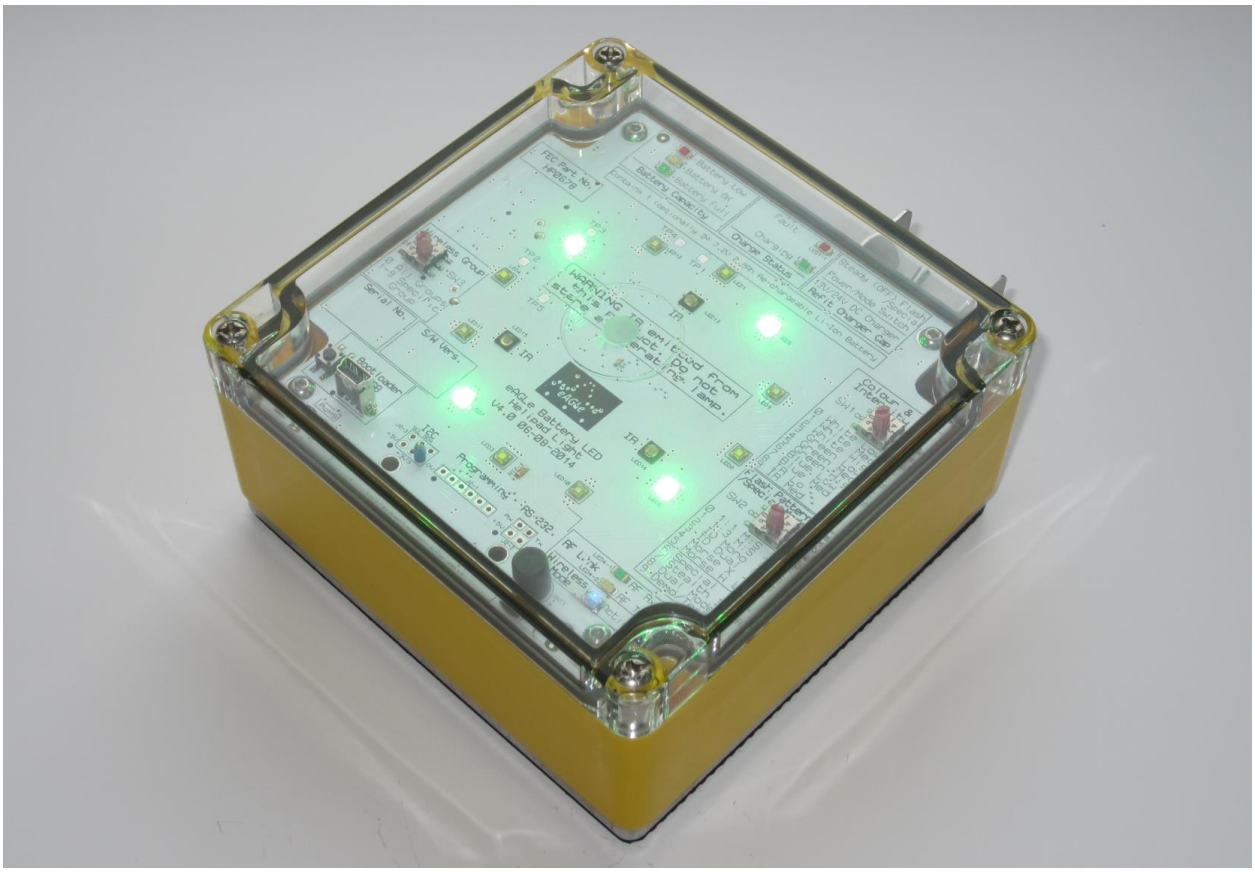
FEC Battery LED Helipad Lights

Type: FEC - HP0678

User Manual – Specification – Diagnostics



Battery LED Helipad Light displaying Green

This device emits Infra-Red radiation

Never stare at the IR emitters as this may cause damage

Read this manual before operating the unit

Issue: 2.0 **7th October 2014**

Powered by eAGLe Light Engines

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Document Revision Sheet

Issue	Date	Changes
1	09/08/2013	New Document
1.1	21/08/2013	Minor updates and corrections
1.2	29/09/2013	Updated table to reflect production units with weighted bases Case details changed for up to 6 units per case.
1.3	02/10/2013	Run-time figures updated
1.4	01/11/2013	Updated to include automatic Sunset/Sunrise switching and light output figures
1.5	04/11/2013	New Sunset Switching Test Results
1.6	12/12/2013	New Photograph of 6 unit case and PSU. Updated weight table
2.0	07/10/2014	Revised document for new version of light and case: • Wireless enabled HeliLight with user software upgrade • Nanuk case for 8 HeliLights

Special Edition 'Black Knight' lights and Key Fob Controler (KFC)

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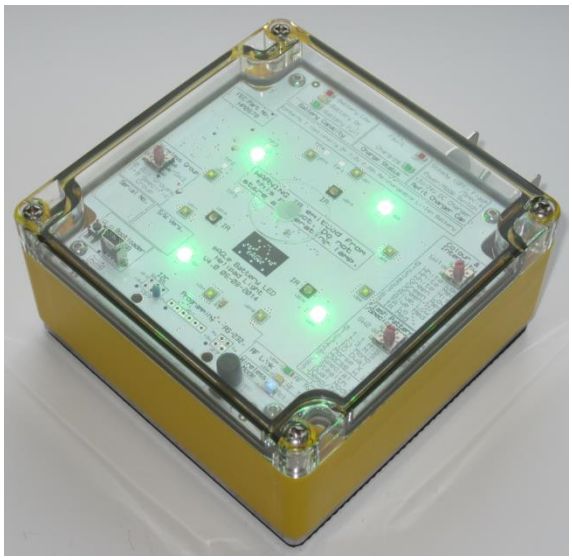
Battery LED Helipad Lights

User Guide

Overview



The FEC Battery LED Helipad Lights (In this manual referred to as the light or lights) are an advanced battery powered, microprocessor controlled helipad light designed for rapid deployment in temporary and emergency situations to provide safe and effective marking. In steady light mode, constant light level is achieved for up to 15 hours before recharging. In flashing mode running time is significantly extended.

Part Number

FEC - HP0678

- 3 colours + IR – White, Green, Blue and Infra-Red

Model Characteristics

The lights use advanced LED and microelectronics to provide a safe and effective lighting solution for temporary and emergency situations.

The lights are manufactured in robust ABS and acrylic enclosures with stainless steel fittings for durability and long life. The lights are sealed to IP65 rating.

The lights have a number of operating modes: steady visible or infra-red, steady visible and infra-red and a number of flash patterns in the above combinations.

In steady mode the LEDs provide continuous and constant light output for between 3.75 and 15 hours depending on the colour and intensity level selected.

In flashing modes there are 5 selectable flash patterns to choose from through a simple on-board switch. Once selected, the pattern will output each time flash mode is selected.

Groups of lights can be wirelessly controlled.

The lights are supplied as a set of up to 8 in a robust Nanuk case which incorporates a mains power supply to simultaneously charge all fitted lights.

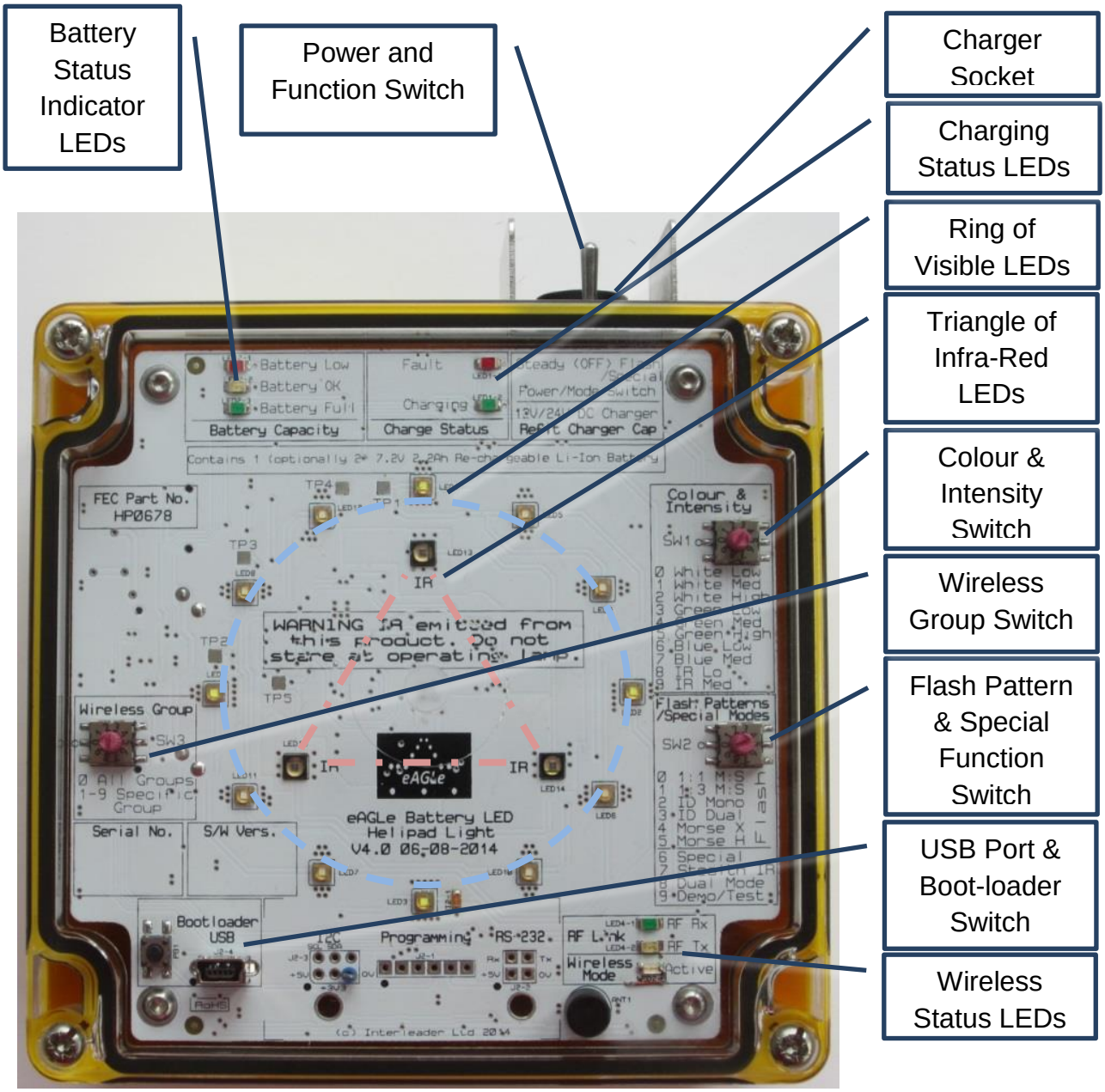
The power source may either be 110/230V AC or 12-24VDC with cables supplied and connected for both and stored in the case.

The lights have stainless steel bases with rubber anti-skid bottoms. The standard light has a 6mm plate but for more extreme applications 8mm and 12mm are options.

1. The Helipad Light

A Battery LED Helipad Light is shown in the picture below.

The units are completely self-contained and incorporate; the Li-Ion battery, advanced battery charging control and monitoring system, microprocessor main controller, advanced LED driver unit, visible and infra-red LEDs, programming switches for colour, intensity, flash/special mode and wireless group selection, main switch, charging socket and Mini USB port and switch for field upgrade of software.

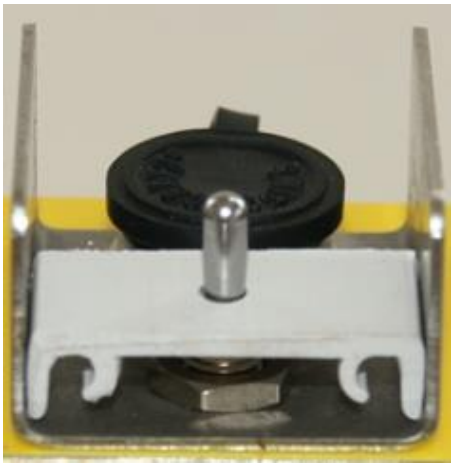


2. Basic Operation

Sections 2a to 2d below show the three switch positions and their actions:

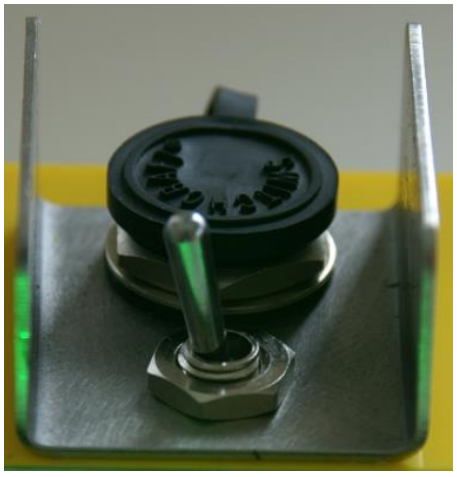
2a: Switch in Off Position

The switch should always be returned to the off position after use (top photo), during charging and storage.



2b: Switch in Off Position for Air Transport

The switch must be in the off position and the switch keeper fitted (middle photo) when the light is to be transported on board an aircraft. See section concerning readying for transport.



2c: Switch in On (Steady Light) Position

When the light is switched on in Steady Light mode (bottom photo) a brief flash may be observed. In this start-up phase the controller is performing system checks before turning the LEDs on to the colour and intensity set by the Colour & Intensity rotary switch.

The LEDs will then be lit and will remain on as long as the switch remains in this position and there is sufficient charge in the battery.

A key safety feature of the lights is that the LED brightness is kept constant as the battery discharges, right down to the point of exhaustion.

When operating the state of the battery is shown via the three Battery Capacity ‘Traffic Light’ LEDs at the top-left of the light (see section Battery Capacity).

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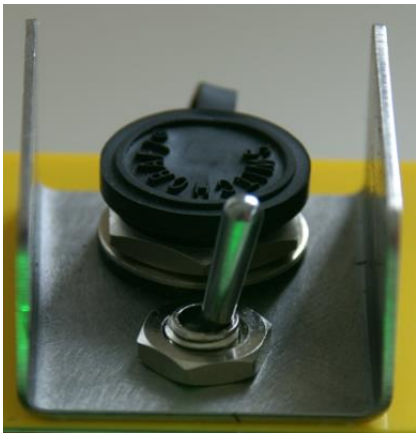
2d: Switch in On (Flashing Light/Special Function) Position

When the Light is switched on in Flashing Light/Special Function mode a brief flash will be observed. In this start-up phase the controller is performing system checks before turning the LEDs on to the colour and intensity set by the Colour & Intensity rotary switch.



The LEDs will then begin the flash pattern or special function that has been selected on the programming switch on the main circuit board.

As for Steady Mode, the LED brightness is kept constant as the battery discharges, right down to the point of exhaustion.

When operating the state of the battery is shown via the three Battery Capacity 'Traffic Light' LEDs at the top-left of the light (see section Battery Capacity).

The basic Flash or Special Functions are:

Mode	Description	Flash Rate	Special Function
0	1:1 Mark:Space Ratio	120 Flashes / Minute	
1	!:3 Mark:Space Ratio	60 Flashes / Minute	
2	Identification Light Single Flash	30 Flashes / Minute	
3	Identification Light Double Flash	30 Frames / Minute	
4	Morse Character 'X'	30 Characters / Minute	
5	Morse Character 'H'	30 Characters / Minute	
6	Special	No Flash	This software: Automatic Sunset/Sunrise switching
7	Stealth IR	No Flash	IR only
8	Dual Mode	No Flash	Visible and IR
9	Demonstration Mode	15 seconds per pattern	Cycles through Modes 0 - 6

As standard, lights are delivered either set to Special (Sunset/Sunrise switching) Mode (SW2 = 6) or Dual Mode (SW2 = 8) depending on region and customer preference.

3. Battery Capacity 'Traffic Light' LED indicators

All the time that the unit is switched on (either steady mode or flashing/special function mode) the on-board microprocessor monitors the battery voltage to ensure that operation remains within the safe working limits of the battery and to ensure its maximum life.

In all modes, except 'stealth mode', when the light is turned on the battery voltage/capacity is indicated via the three 'traffic light' LEDs.

Their status may be interpreted as follows:

LED Status	Battery Voltage	Meaning
Red flash every 10s	<6.0V	Battery exhausted – Switch off & Recharge
Flashing Red every 1s	6.0V - 6.25V	Battery nearing exhaustion. Switch off & Recharge
Solid Red	6.25 – 6.8V	Battery low (<20% remaining).
Solid Orange	6.8V – 7.5V	Battery medium (between 20% and 80% capacity)
Solid Green	>7.5V	Battery Full (>80% capacity)

In practice the green LED will not remain lit for much of the total running time. Most of the running time is spent with the orange LED on. This is totally normal and to be expected.

Also note that at the transition point between, for example, orange and red, the LEDs may display alternate orange/red at a rate of 1 second per colour. This is perfectly normal.

If the light has been run continuously until the battery is nearly exhausted and then turned off, the battery voltage may 'recover' a little. If turned back on, this may show as either the red or orange light coming on briefly but the light quickly indicating a low battery and shutting down.

Stealth Mode

In Stealth Mode (see later section for details of operation) only the IR LEDs will be lit at the intensity set by SW1 (Colour and Intensity). This is to enable the light to be seen with Night Vision Goggles but not with the naked eye.

When the light is first switched on in Stealth Mode, the Battery Capacity LEDs will light for 5 seconds to indicate the battery capacity. After this initial period, the Battery Capacity LEDs will turn off and the IR LEDs switch on.

If a low IR intensity has been selected the light may appear to be neither on nor emitting any light (see later section on how to check this).

The IR LEDs will continue at constant intensity until the battery voltage gets to just above the exhausted state (about 5% left), at which point the red Battery Capacity LED will start to flash as it would in any other mode.

4. Charging – *Do NOT Charge with the Case Lid Shut*

The lights are charged in their carrying case using the integrated mains Power Supply Unit (PSU) or connection to a nominal 12V or 24V DC supply (e.g. car or truck).

Connections:

- First ensure that the mains PSU and 12-24V supplies are disconnected.
- Ensure that all of the lights are fitted into the case properly
- Open the weather proof caps of the charger sockets (photo right) and push its respective plug fully home
- Either:
  - Connect the PSU to the mains and switch on, or
  - Connect DC connector to a 12V – 24V DC source

Charging Limits:

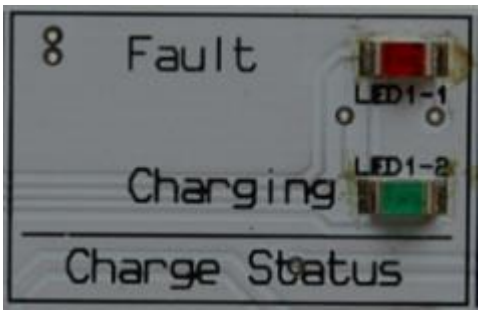
The mains PSU is capable of charging 8 lights from fully exhausted to fully charged in about 2 hours (max 3 hours) if the case of the PSU is below 40C (104F). If the ambient temperature is very high and the case temperature is above this, only 4 lights can be charged simultaneously. If the case/PSU temperature is above 50^{o}C (122^{0}F) the PSU must not be used.

If charging 8 fully exhausted lights from a vehicle's 12V supply the total load will be 6 Amps. The cable and connector (with 8 Amp fuse fitted) are capable of supporting this load.

Be aware that many vehicle supply sockets may be unable to support this load or that the vehicle's socket (and then the cable connector) may get hot. This could present a fire hazard. This is particularly likely with an old, used socket. If in doubt, reduce the number of lights being charged simultaneously. Also be aware that this load will take charge from the vehicle battery.

Status LEDs:

- When power is first applied to the lights, the internal charging circuit first determines the state of the battery, only going to full charge if the battery passes the initial test. If there is a problem with the battery the red Fault LED will be lit. See later section on action to take.
- The charger is an intelligent dual-rate charger and, after the initial battery check, will determine exactly how long to charge the battery and at what rate, switching automatically to a trickle charge at the end of the main charge. During the initial high charge rate the Charging LED will be lit. This will extinguish as the charge rate tapers off and the charger begins its final charge phase.



After Charging:

- Once fully charged (and with the charger still connected and switched on) all LEDs will be off. **At this point turn off the charger.**
- Li-Ion batteries have a very low self-discharge current and neither need nor benefit from trickle charging.
- A refresh cycle should be performed once every 6 month (more frequently in very hot conditions – see table below) to maintain full charge and best battery condition and life.

Temperature	Remaining Capacity	After
23°C / 73°F	➢ 95%	6 months
45°C / 113°F	➢ 80%	3 months
60°C / 140°F	➢ 80%	1 month

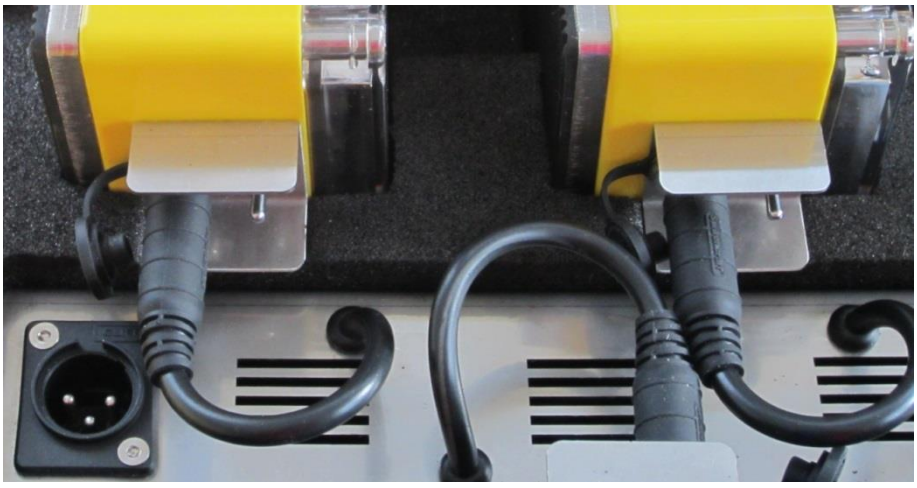
Dis-Connection:

- To disconnect the charger, switch off the mains supply and remove the power cord or disconnect the DC power cable - The charging cables may be left connected
- Before next use, ensure that all of the charging socket covers are pushed fully home. This is to ensure that the case remains weatherproof

Good Practice:

- **Never charge batteries with the case lid shut**
- DO NOT leave charger connected and 'trickle charging'
- Always isolate from the mains before connecting/disconnecting
- Only charge batteries indoors in dry conditions
- Keep batteries away from sources of heat and direct sunlight
- Routinely recycle as outlined above
  - Never charge a battery that appears damaged
  - Never use a power cord that is damaged in any way

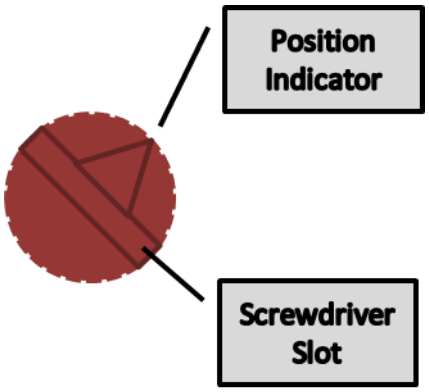
If in doubt – have it checked out



Lights correctly installed and connected in the case for charging

5. Colour & Intensity Setting

In all modes, except Stealth Mode, the Colour and Intensity rotary switch controls which colour is lit and at what intensity. This applies in both Steady and Flash modes.



To change the setting requires that the top transparent cover is removed, the switch set and the cover replaced.

Note that the switch may be turned either with a small flat bladed screw driver or by holding the knurled shaft. Only light pressure need (and must) be applied to turn the switch.

The switch has 'detents' for each position and as each position is correctly set you can feel a slight 'click'.

The drawing to the right above shows the screwdriver slot and the position indicator on top of the knob. There is also a groove in line with the position indicator on the face of the knob to help confirm the selection made. In both the drawing and the photograph below, position 4 (Green Medium) is shown.

It is quite safe, and in fact recommended, that the Colour and Intensity for the visible colours is set while the unit is switched to steady mode. To select the desired visible colour and intensity, turn the unit to steady mode and slowly rotate the knob (clockwise or anti-clockwise) one click at a time until the desired colour /intensity is displayed.

The microprocessor reads the switch ten times a second and changes the colour and intensity as you turn the knob. However, rotating the knob too fast or not properly selecting the detent positions may lead to an undesired selection. If this happens slowly rotate the knob slightly and your desired selection will be made.

The photo to the right shows the Colour and Intensity switch set to position 4 - Green/Medium Intensity. To reset to a different colour/intensity simply rotate the knob to the desired position. For example, to set to White/Low, rotate the knob anti-clockwise to position 0.

Once you are satisfied that the correct colour/intensity has been selected, refit the lid and test by turning the unit on again.

The eye cannot see infra-red and thus a different technique must be used to check that the correct setting has been made. If the unit is to be used with Night Vision Goggles (NVG) these can be used as part of the setting process (but be careful not to point directly at the source or you may damage them).

As an alternative, the built in cameras of some smart-phones (but not iPhone 5) are sensitive to IR. Try the main and face cameras of your smart-phone to determine if it can be used this way.

6. Run Time in Steady Mode

The following are representative of the expected run time of lights in 'Steady Mode' (on constantly assuming a fully charged battery).

Mode	Description	Run-time
0	White – Low	➢ 14 hours
1	White – Medium	6.5 hours
2	White – High	4.75 hours
3	Green – Low	➢ 13 hours
4	Green – Medium	6.5 hours
5	Green – High	4.25
5	Green – Boost (SW2 = 6)	3 hours
6	Blue – Low	➢ 15 hours
7	Blue – Medium	6.5 hours
8	IR – Low	➢ 25 hours
9	IR – Medium	12.5 hours
Stealth Mode	IR – High	6.75 hours
Dual Mode	Medium Green + IR	5 hours
Dual Mode	High White + IR	4.25 hours

As standard, lights are delivered set to Green – Medium (SW1 = 4).

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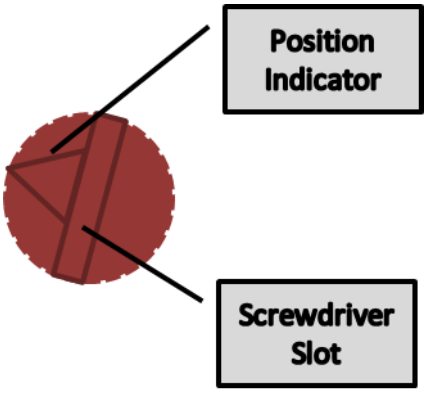
7. Flash Patterns and Special Function Modes

When the power switch is set to Flash/Special, the Flash Patterns/Special Modes switch determines what function to perform.



Note that with the exception of Stealth Mode, the Colour and Intensity rotary switch controls which colour is lit and at what intensity, as it does for Steady mode.

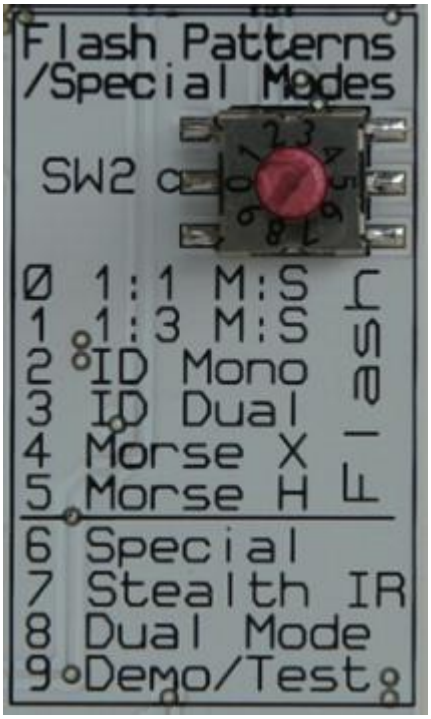
To change the setting requires that the top transparent cover is removed, the switch set and the cover replaced.

Setting the switch is exactly as described for the Colour & Intensity Switch.

It is quite safe, and in fact recommended, that the Patterns/Special Modes for the visible colours is set while the unit is switched on. To select the desired flash pattern or special function, turn the unit to steady mode and slowly rotate the knob (clockwise or anti-clockwise) one click at a time until the desired flash pattern or special function is displayed.

The microprocessor reads the switch ten times a second and changes the colour and intensity as you turn the knob. However, rotating the knob too fast or not properly selecting the detent positions may lead to an undesired selection. If this happens slowly rotate the knob slightly and your desired selection will be made.

The diagram above and the photo to the right show the Patterns/Special Modes switch set to position 1 - 1:3 Mark:Space Flash Pattern. To reset to a different flash pattern or special function simply rotate the knob to the desired position.



Notes:

1) At any time the colour and intensity can also be changed (see previous section)
2) Position 6 - Special: In this version of software, the light level is monitored and when a light level of 400 Lux or less is detected, the light comes on. If testing in bright conditions the lights may therefore not come on.
3) Both Stealth Mode and Demo/Test are different in that once started the processor will not re-read the switches. To return from these settings, turn the unit off, change the mode switch and turn the unit back on again
4) In Mode 8 – Dual Mode both the visible LED selected by the Colour & Intensity switch AND the IR LEDs will be on. Take care not to stare at the LEDs

Once you are satisfied that the correct flash pattern or special function has been selected, refit the lid and test by turning the unit on again.

8. Flash Patterns

The first 6 positions of the Flash and Special Function Switch select the following flash patterns:

Mode	Description	Timing	Flash Rate
0	1:1 Mark:Space Ratio	On – 250mS Off-250ms	120 Flashes / Minute
1	!:3 Mark:Space Ratio	On-250mS Off-750mS	60 Flashes / Minute
2	Identification Beacon Single Flash	On – 200ms Off – 1800mS	30 Flashes / Minute
3	Identification Beacon Double Flash	On – 200mS Off – 100mS On – 200mS Off – 1500mS	30 Frames / Minute
4	Morse Character ‘X’	On – 300mS Off – 100mS On – 100mS Off – 100mS On – 100mS Off – 100mS On – 300mS Off – 900mS	30 Characters / Minute
5	Morse Character ‘H’	On – 100mS Off – 100mS On – 100mS Off – 100mS On – 100mS Off – 100mS On – 100mS Off – 1300mS	30 Characters / Minute

9. Wireless Controller

If the Battery HeliLight is fitted with a wireless interface then the wireless LEDs and antenna (ANT1) will be visible at the bottom left corner of the top panel (photo right).

All lights are shipped in Manual mode and will operate at the colour and intensity selected by SW1 and perform the flash pattern or special function selected by SW2 (see sections 5, 7 and 8).

Manual and Wireless Modes

Unless previously set to wireless mode, all lights will come on in manual mode and the blue Wireless Mode Active LED will be off.

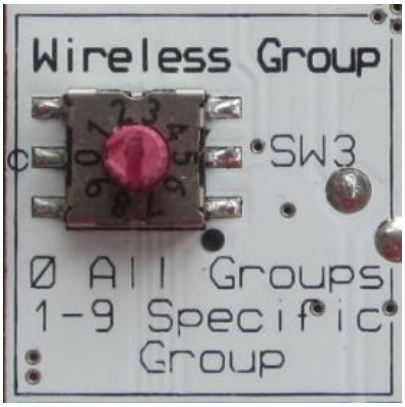
Wireless Mode Active (blue LED) will light when the unit is in wireless mode.

Wireless Groups

To enable control a specific group of lights in a situation where multiple groups are deployed (for example, multiple adjacent pads), the Wireless Group switch (SW3) allows each light to be assigned to a 'Group'. Groups of lights will then respond to Key Fob Controllers (KFC) or Remote Lighting Controllers (RLC) set to that group number.

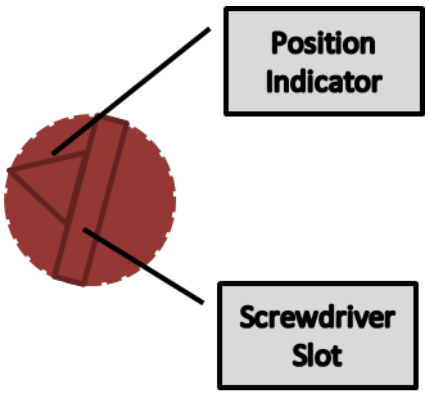
Lights are shipped with the switch set at Group 0 (as are the KFC and RLC default settings) and if only one group of lights is to be controlled, this switch need not be changed.

If multiple groups of lights are to be controlled then each set needs to have the Group switch set to the desired group number (1-9) and the KFC and RLC settings made accordingly.



All lights, irrespective of the group number selected will respond to a KFC or RLC that addresses group 0.

The Group switch in the picture to the left is shown in position 0.



Wireless Colour & Intensity and Flash Pattern/Special Function Settings

In the same way that Colour & Intensity and Flash Pattern/Special Function Settings are selected via SW1 and SW2 in Manual Mode so the lights retain an internal memory of the respective Wireless Mode Colour & Intensity and Flash Pattern/Special Function Settings.

The Default settings are also the same as the Manual settings (Green/Medium and Sunset Switching). Whenever the Wireless Restore command (Long press of KFC blue button) is received the memory will be set back to these settings.

The range of Wireless settings is exactly the same as the Manual settings (with the exception of the Demo/Test Mode). To alter the settings follow the following steps (see over for details):

To Change the Wireless Colour/Intensity setting

1) Turn the light on with the external main switch in the direction of Steady
2) Switch to Wireless Mode with a short press of the black button of the KFC
    - Ensure that the blue Wireless Mode LED on the light is lit
3) A short press of the red button on the KFC will advance to the next colour/intensity
4) A short press of the blue button on the KFC will decrement to the previous colour/intensity
    - The light will immediately change to the new setting and store it in its memory
5) Once the desired colour/intensity is reached, give a long press on the red button to return to Manual Mode
6) The next time the light is turned on in wireless mode (steady or flashing) it will come on at the new stored colour/intensity

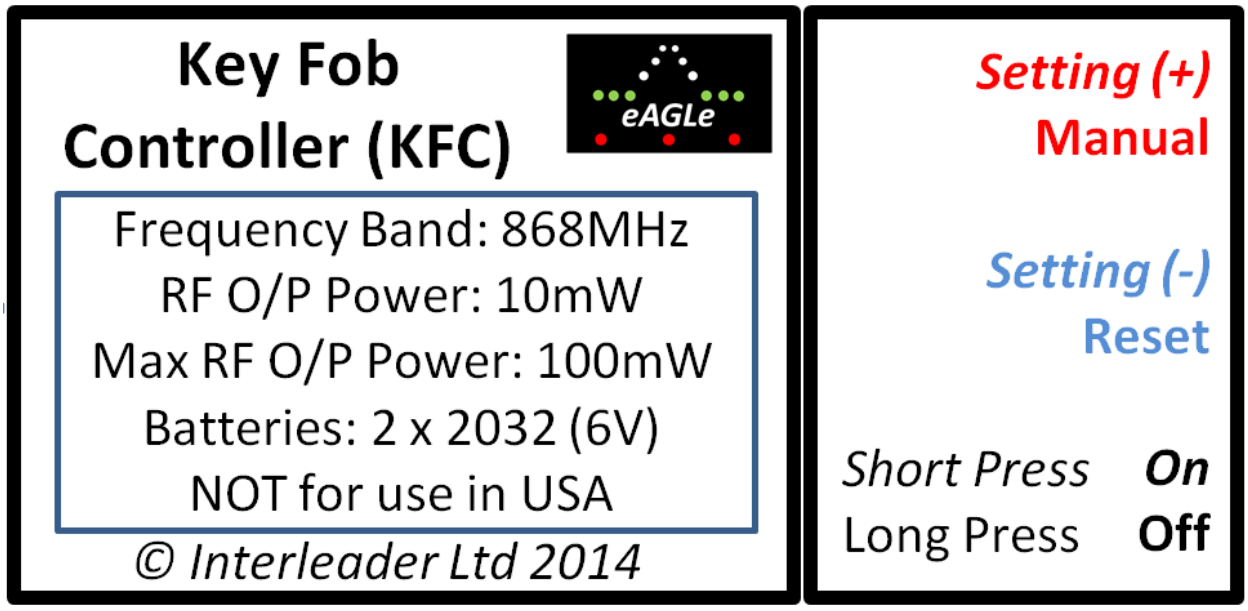
To Change the Wireless Flash Pattern/Special Function setting

1) Turn the light on with the external main switch in the direction of Flash/Special Function
2) Switch to Wireless Mode with a short press of the black button of the KFC
    - Ensure that the blue Wireless Mode LED on the light is lit
3) A short press of the red button on the KFC will advance to the next Flash/Special Function
4) A short press of the blue button on the KFC will decrement to the previous Flash/Special Function
    - The light will immediately change to the new setting and store it in its memory
5) Once the desired next Flash/Special Function is reached, give a long press on the red button to return to Manual Mode
6) The next time the light is turned on in wireless mode (flashing/special function) it will come on at the new stored wireless flashing/special function setting.

Key Fob Controller (KFC) Commands

There are 6 commands available from the three button KFC. This is achieved by either pressing a button for a short or long 'press'. The short press is a momentary action (press-immediate release), the long press a press-hold-release action. A short press of a button is indicated by a single flash of the FFC LED, a long press by a dual flash (see table next page for colours).

The graphic below shows the KFC labels (left – back, right – front) of the KFC:



Starting in Manual Mode and switched on, all KFC button presses are ignored until there is a short press of the black button (right graphic, bottom). This button does two things:

1) Puts any light with the same group number as the KFC into Wireless Mode, and
2) Turns the light(s) on

The light(s) will come on in either Steady or Flash Pattern/Special Function mode depending on which way the main switch has been selected. The Colour/Intensity and Flash Pattern/Special Function will be determined by the Wireless Settings (see previous page).

To return to Manual Mode, press and hold the red button.

To turn the light off, press and hold the black button – NB: Turning the light off in Wireless Mode does not return the light to Manual Mode. Turning the light off extinguishes the LEDs and leaves the light in Wireless Mode – With the blue Wireless Mode LED lit.

Table of Key Fob Controller (KFC) Commands

Button	Short Press	Long Press	Key Fob LED lights status	'Wireless' LED on light	Comment
Black	Wireless Mode – Light On		1 green flash	On	Puts light in wireless mode and turns light on (to pre-programmed 'Wireless Mode' setting)
		Wireless Mode – Light Off	2 green flashes	On	Turns light off **AND** Leaves light in wireless mode
Red	Advance 'Wireless Mode' programme		1 red flash	On	If the Light has been switched to 'Steady' then the **next** Colour & Intensity is selected and stored. E.g. Green/Low -> Green/Medium If the Light is in 'Flashing/Special' the **next** Flash Pattern or Function is selected and stored . E.g. ID Dual -> Morse X
		Manual Mode	2 red flashes	Off	Returns Light to Manual mode
Blue	Decrement 'Wireless Mode' programme		1 blue flash	On	If the Light has been switched to 'Steady' then the previous Colour & Intensity is selected and stored. E.g. Green/Medium -> Green/Low If the Light is in 'Flashing/Special' the next Flash Pattern or Function is selected and stored . E.g. Morse X -> ID Dual
		Restore 'Wireless Mode' Defaults	2 blue flashes	On	Restores the Wireless Mode' Defaults – Currently Green/Medium and Special (Sunset switching)
Red & Black	Both buttons pressed at exactly the same time		5 Blue->Green->Red flash cycles, then solid blue for 3 seconds	Unchanged	Re-programmes internal wireless module with default settings and re-starts main processor

10. Run Time in Flash Mode

The following are representative of the expected run time of lights in 'Flash Mode' (assuming a fully charged battery).

SW1 Colour & Intensity	SW2 Flash Pattern	Description	Run-time
4	0	Medium Green – 1:1 Flash Pattern	12 hours (est.)
5	0	High Green – 1:1 Flash Pattern	8 hours
2	1	High White – 1:3 Flash Pattern	➢ 16 hours
5	5	High Green – Morse 'H'	➢ 25 hours

Battery LED Helipad Lights – Nanuk Case

11. Special Function – Sunset/Sunrise Switching

Position 6 of the Flash Pattern/Special switch selects automatic Sunset and Sunrise switching of the colour and intensity set with switch 1.

When switched to this mode in daylight, the Battery Capacity LEDs will light as normal but the main LEDs will be off until the light level becomes less than 400 Lux (the level of light at sunset on a clear day) at which point they will turn on.

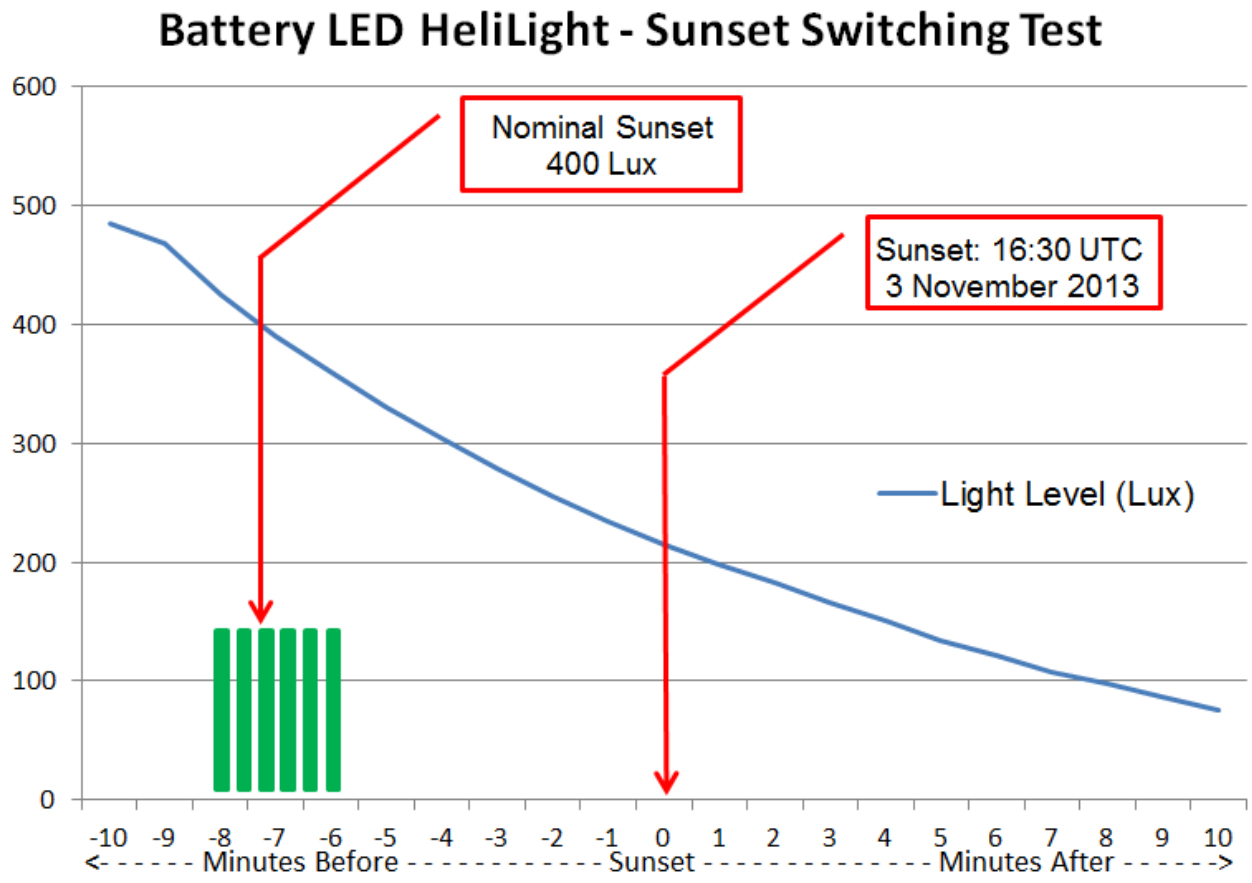
In a pattern of, for example, 5 lights it is to be expected that it may take up to 5 minutes for all lights to come on due to internal differences in their light readings.

Note that it is the light level that turns the lights on and off, not the time of day. Very overcast conditions causing a dark sky may cause light levels to drop significantly below 400 Lux even though the time is not at sunset. This will cause the lights to come on (see test results below).

The units monitor light level continuously and if the 'sunrise' light level of 450 Lux is exceeded, the lights will go off again.

This may lead to a situation where if the lights are set to automatic and before sunset a large black cloud causes the lights to turn on, but then moves away, they may go back off again.

The graph below shows the drop in light level from 10 minutes before to 10 minutes after sunset. The green bars indicate the actual time the test set of lights came on.



12. Special Function - Stealth Mode

In Stealth Mode only the IR LEDs will be lit at the intensity set by SW1 (Colour and Intensity). This is to enable the light to be seen with Night Vision Goggles but not with the naked eye.

The Colour and Intensity switch changes its mode of operation in Stealth Mode and every position represents a different intensity level. These are arranged as a binary series whereby each step is double the power of the previous one. This provides for a very wide range of power settings to match different operational requirements.

The relative intensity, approximate power consumption and run-time are shown in the table below:

'Colour & Intensity' Switch Setting	Relative Intensity	Run Time (hours/days)
0	1	366/15
1	2	293/12
2	4	244/10
3	8	183/7.5
4	16	129/5.4
5	32	76/3.2
6	64	42/1.8
7	128	22/0.9
8	256	11/0.5
9	512	5.8/0.2

When the light is first switched on in Stealth Mode, the Battery Capacity LEDs (and Wireless Mode blue LED if in Wireless Mode) will light for 5 seconds to indicate the battery capacity (and Wireless Mode). After this initial period, the Battery Capacity LEDs (and Wireless Mode blue LED) will turn off and the IR LEDs switch on.

If a low IR intensity has been selected the light may appear to be neither on nor emitting any light (see Colour & Intensity section on how to check this).

The IR LEDs will continue at constant intensity until the battery voltage gets to just above the exhausted state (about 5% left), at which point the red Battery Capacity LED will start to flash as it would in any other mode.

13. Special Function – Dual Mode

There may be instances where pilots require both visible light and infra-red lights in the pattern of light so that they can either use normal vision or augmentation through the use of Night Vision Goggles (NVG).

This requirement is supported in Dual Mode where both visible and IR LEDs are lit simultaneously.

Once Dual Mode is selected, the colour and intensity of the visible LEDs is selected in the normal way through the Colour & Intensity switch.

In dual mode the IR LEDs are run at similar power of the visible LEDs.

Note that The Colour & Intensity switch must be set to one of the visible colour settings for dual mode to work.

As standard, lights are delivered set to either:

a) Special (Sunset/Sunrise switching) Mode (SW2 = 6), or
b) Dual Mode (SW2 = 8)

depending on region and customer preference.

As standard, lights are delivered set to Green – Medium (SW1 = 4).

14. Dimensions

Lights (each)

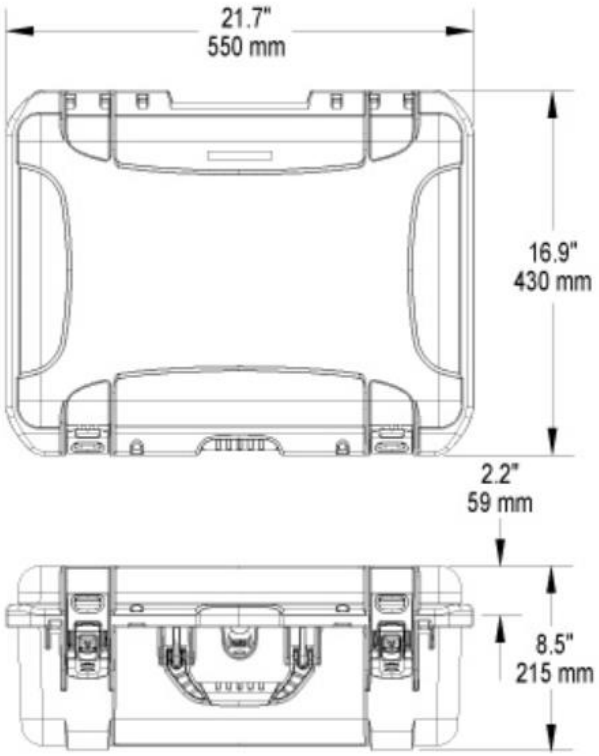
Dimension	Value (mm/inches)	Comment
Width	122mm / 4.8 inches	
Length	120mm / 4.7 inches	Excluding Switch Guard
	137mm / 5.4 inches	Including Switch Guard
Height	*57mm / 2.25 inches*	*No base – non-standard product*
	62mm / 2.45 inches	Including 6mm base – Standard product
	66mm / 2.60 inches	Including 8mm base
	70mm / 2.77 inches	Including 12mm base

Case (without packaging)

Dimension	Value (mm/inches)
Width	550mm / 21.7 inches
Length	430mm / 16.9 inches
Height	215mm / 8.5 inches
Lid	59mm / 2.2 inches

Case (with shipping packaging)

Dimension	Value (mm/inches)
Width	560mm / 22.0 inches
Length	445mm / 17.5 inches
Height	225mm / 8.9 inches



Exterior Dimensions

15. Weight

The weight of the individual lights and complete sets (6 lights, case, charger and mains and DC cables) are as follows:

Item	Weight (kilograms)	Weight (US pounds)	Comment
Single Battery LED Helipad Light (no base)	*0.66kg*	*1.44lb*	*A non-standard product*
Single Battery LED Helipad Light (6mm Stainless Steel base)	1.3kg	2.87lb	6mm Standard base
Single Battery LED Helipad Light (8mm Stainless Steel base)	1.5kg	3.30lb	Optional 8mm Medium base
Single Battery LED Helipad Light (12mm Stainless Steel base)	1.93kg	4.26lb	Optional 12mm Heavy base
Case – Empty (including power supply and mains and DC cables)	6.7kg	14.77lb	
System: 8 Helipad Lights in Case (including power supply and mains and DC cables)	17.1kg	37.69lb	Standard 6mm bases. Operational system weight
System packed for Shipping	18.1kg	39.90lb	As above but with outer foam and shipping box

16. Environmental (Lights)

- Degree of protection IP65 (only when charging socket cover is properly fitted)
- Helipad Light Operating temperature: -25^{o}C to +40^{o}C
- Charging temperature: -25^{o}C to +40^{o}C
- System Storage temperature: -25^{o}C to +50^{o}C
- Shock – TBC
- Fully ROHC Compliant

17. Electrical Specification (Lights)

Parameter	Value
Operating voltage (nominal):	7.5V DC
Absolute voltage range:	6.0V – 8.4V DC
Charger input voltage range:	13.5V – 28.0V DC
Running power consumption:	5.0 watts (maximum with steady light)
LED power consumption (total):	4.6 watts (maximum with steady light)
Power rating of LEDs	30% of manufacturers maxima
On-board fuses:	2 * 1 Amp (self re-setting type)
Reverse voltage protection:	Polarity protected on charger
LED controllers (1off):	Under voltage, short circuit and overvoltage protected
LED Lifetime (projected):	>50,00 hours
Battery:	Li Ion Battery Pack
Battery Manufacturer:	Enix
Battery Type:	MGL2807
Nominal Voltage:	7.5V
Nominal Capacity:	2.2Ah
Nominal Energy:	16.5Wh
Battery Protection:	Internal self-resetting fuse

18. Electrical Specification (DC Charging Cable/Connector)

Parameter	Value
Connector Type:	Fused Lighter Plug
Connector Rating:	12V 10A maximum rating
Manufacturer:	TruConnect
Contact Resistance:	100mΩ Max.
Operating Temperature:	-20C ~ +65C (-4F ~ 149F)
Fuse:	8A (slow blow) 32mm / 1 1/4inch
Cable Type:	3182Y 1.0mm PVC 300/500V, HO5VV-F2
Manufacturer:	AVSL
Manufacturer's Part Code:	804.332 UK
Conductors:	2 * 1.0mm - 2 x 32/0.2mmØ
Approvals:	BSI approved to BS6500, VDE approved.
Current Rating:	10Amp

All specifications are manufacturer's data

19. UHF Radio Modem Specification (Not USA)

The same UHF Radio Modem is used in the FEC Remote Lighting Controller (RLC), Key Fob Controller (KFC) and optionally fitted to the Battery HeliLights.

The Modem has the following specification.

Parameter	Value
Manufacturer:	RF Solutions Ltd. UK
Modem Type:	ZULU-M868-SO
Nominal Frequency Band:	868MHz
Frequency Options:	868.400, 868.900, **869.450**, 869.600 and 869.800 MHz
Frequency Set to:	869.450
Bandwidth per Channel:	100kHz
Deviation:	45kHz
Maximum Power Output:	100mW (20dBm)
Power Output (RLC & Lights):	100mW (20dBm)
Power Output (Key Fob):	12.6mW (11dBm)
Maximum RF Input Power	+10dBm
Receiver sensitivity:	Max –121dBm (-102dBm (Max) to -109dBM (Min) at 115kbps)
Key Fob Control Range:	>250m (line of sight, light at ground level)
RLC Control Range:	Up to 2km depending on RLC aerial positioning and terrain
Addressing:	24bit secure data protocol
Addressing Schema:	One to Many
RF Baud Rate:	56kbps
Modem Data Rate:	19.2kbps
Modulation:	Frequency Shift Keying (FSK)
Operating Temperature:	-40C to +85C
Compliance:	CE (see table below)

RF Channel Selection

The EU standard sets maximum power transmission limits dependent on frequency, bandwidth and application. A rough guidance applicable to the ZULU channel numbers is given below

Channel Number	Frequency Centre (MHz)	EU Power Allowance mW/dBm	Notes
0	868.400	25/14	Applicable standard - EN300-220
1	868.900	25/14	
2	**869.450**	**100/20**	
3	869.600	100/20	
4	869.800	25/14	

All specifications are manufacturer's data

20. Electrical Specification (Mains Power Supply Unit)

The Mains PSU fitted is a 100 watt unit identified on the PSU enclosure.

Parameter	Value (100 watt unit)
PSU Type:	Universal AC input / Full range
Rating:	15.0V 6.7A 100W max rating
Manufacturer:	Meanwell
Type:	LPV-100-15
Mains electrical connector:	2 pole AC via flying leads
Protections:	Short circuit / Overload / Over voltage / Over temperature
Case:	Fully enclosed plastic
Safety:	IP67
Earthing:	None – Double Insulated – PSU casing has earth bonding
No-load power consumption:	<0.5W
Compliance:	EMC Emission: EN55022 Class B, EN61000-3-2 Class A EMC Immunity: EN61000-4-2,2,4,5,6,8,11 EN55024 light industry level, criteria A
Absolute Input voltage range:	90V – 264V AC 47- 63Hz 127V – 370V DC
Operating Input Voltage Range:	100V – 240V AC
Absolute Operating Temperature Range:	-25C to +70C -13F to +158F
Operating Temperature Limits: 8 lights on full charge: 4 lights on full charge:	PSU Casing Temperature: 40C 104F Max 50C 122F Max
Meantime Between Failures (MTBF):	703,000hours MIL-HDBK-217F (25C)
Efficiency:	87.5%

All specifications are manufacturer's data

IP67 CE

21. Electrical Specification (Power Cord Sets)

All power cord sets are approx 2m/6 feet long unless otherwise noted.

The following power cord sets are supplied for the defined markets:

North Americal Power Cord Set	
UL Approved Rated 125V AC 10A	

UK Power Cord Set	
VDE Approved Rated 250V AC 10A Fused 10A Length 1.8m	

European Schuko Power Cord Set	
CE, VDE and KEMA Approved Rated 250V AC 10A	

Electrical Specification (Power Cord Sets) Continued

The following power cord sets are available as additional cost options:

Australia & New Zealand Power Cord Set SAA(13389), IMQ, SEV, VDE, KEMA, SEMKO, DEMKO, NEMKO, FIMKO Approved Rated 250V AC 10A	
Danish Power Cord Set DEMKO, SEV, SAA(13389), VDE, KEMA, SEMKO, NEMKO, FIMKO Approved Rated 250V AC 10A	
Italian Power Cord Set **IMQ, SEV, SAA(13389), VDE, KEMA, SEMKO, DEMKO, NEMKO, FIMKO** and other approvals Rated 250V AC 10A	

Contact your FEC representative for details of other options.

22. LED Colour Characteristics

- White: 6000°K/6500°K 'Cool White'
- Green: 528nm
- Blue 470nm
- Infra-Red 940nm

Options

At additional cost, units can be supplied with a range of colour LEDs including:

- Deep Blue 455nm
- Yellow: 590nm
- Red-Orange 617nm
- Red: 625nm
- Hyper Red 656nm

23. LED Light Intensity – Approximate

The following gives an indication of the measured light level obtained from the units at different vertical angles and with different colour LEDs.

Colour	White			Green			Blue	
Angle of Elevation	**Low**	**Med**	**High**	**Low**	**Med**	**High**	**Low**	**Med**
-5	3	7	10	2	5	9	3	7
0	6	14	22	4	10	15	5	13
5	7	18	27	7	16	24	8	20
10	9	21	32	7	17	26	8	20
15	11	26	40	10	22	33	12	29
20	13	30	48	11	26	40	15	36
25	18	44	70	13	31	48	18	42
30	18	44	70	13	31	48	18	42
45	22	53	83	15	35	54	21	51
90	26	63	100	17	40	63	24	55

As standard, lights are delivered set to Green – Medium (SW1 = 4).

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24. Special Orders

Software Features

At additional cost, units can be programmed to perform non-standard functions including:

- Different string lengths of Morse Code
- Alternative flash patterns
- Customer specified timing or operation
- Different ratios of visible to IR
- Support additional systems and interfaces (all lights have a computer-computer expansion interface)

Please contact your FEC sales representative to discuss your particular requirements.

25. Spare Parts

There are no other user serviceable parts.

Items requiring repair need to be returned to FEC

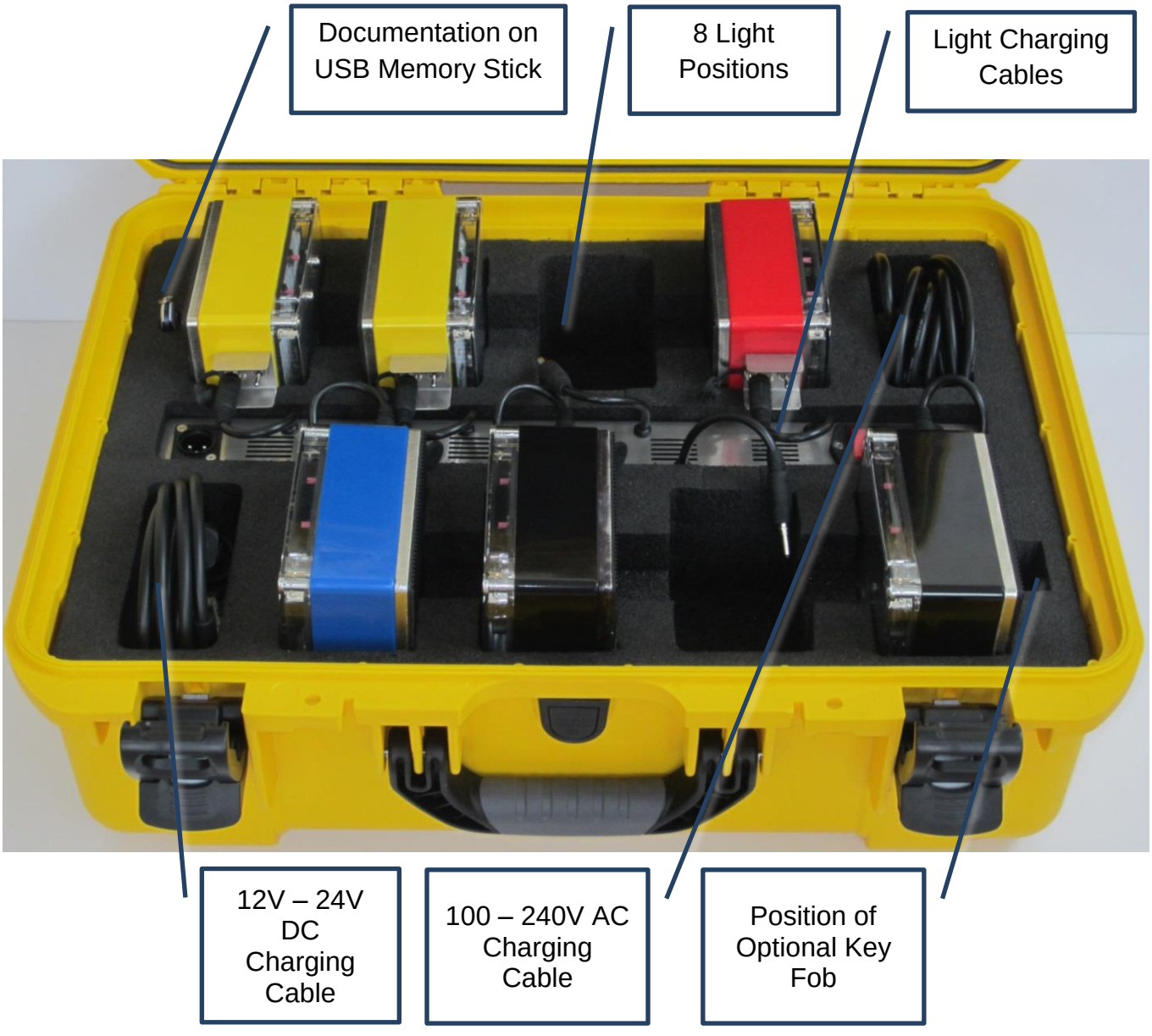
26. Support Documentation

Documentation, including this manual, is contained on the USB memory stick in the case (colour of USB stick will vary).

Also on the USB memory stick are short video clips that demonstrate various aspects of setting up and using the lights and charger. Updates may also be posted on the FEC website.

27. The Carrying and Charging Case

The carrying case can accommodate up to 8 lights, has an integrated 100-240V AC Power Supply Unit (PSU) and leads for connection to either the mains supply (for the PSU) or a vehicle nominal 12-24V DC supply. Note – Non-standard light cases shown.



Always charge lights with the case lid fully open
Lights and PSU may overheat causing fire risk and permanent damage if lid is closed during charging

28. Diagnostics and Fault Finding

The following are the range of simple tests that an end-user of the light can perform – to be carried out in the order given.

Warning

- ***The lights emit high brightness light pulses and/or Infra-Red. Do not look directly at the LED arrays or near reflections of the light.***

Basic Visual Checks – Ensure that:

- The unit is properly mounted, secure and appears physically undamaged
- There are no signs of overheating or leakage (could indicate a split battery)

Basic Operational Checks – Ensure that:

- The switch operates correctly
- If the unit comes on but:
    1. In steady mode – the light flashes briefly and then goes out (indicates an exhausted battery), or
    2. In flash mode the correct sequence is not followed,

    check the charge state of the battery
- If the unit does not come on at all, go to next step
- If unsure of the charge state of the battery, connect to the charger and ensure that the charge cycle is as follows:
    1. There may be a brief period before the Green 'Charging' LED comes on (charger controller is checking the state of the battery)
    2. The Green 'Charging' LED comes on an stays on for up to 2 hours (indicates bulk charge cycle)
    3. The Green 'Charging' LED then goes off (indicates that the charger has entered the trickle charge phase).
- If at any time during charging the Red 'Fault' LED comes on it indicates a fault has been detected by the charger circuit – most likely with the battery.
    1. The first time this happens, disconnect the power and wait 5 minutes before trying again as the fault may clear
    2. Repeated display of the Red 'Fault' LED indicates a serious fault and the light should be returned to FEC for rectification

Returning the Light:

Defective Li-Ion batteries are not permitted to be air transported.

- Turn off the light and fit the switch keeper
- Securely wrap the light in protective foam or similar
- Send the light to FEC for repair – by a permitted carrier (see next section)

29. Transportation

Defective Li-Ion batteries are not permitted to be air transported.

Batteries are subject to special conditions when transported, particularly by air. The relevant ICAO/IATA documents make the following Provision (A67):

IATA-ICAO Provision A67 for the carriage of Batteries

A67 Non-spillable batteries meeting the requirements of Packing Instruction 872 are not subject to these Regulations if, at a temperature of 55ºC (131ºF), the electrolyte will not flow from a ruptured or cracked case. The battery must not contain any free or unabsorbed liquid. Any electrical battery or battery powered device, equipment or vehicle having the potential of dangerous evolution of heat must be prepared for transport so as to prevent:

(a) a short circuit (e.g. in the case of batteries, by the effective insulation of exposed terminals; or in the case of equipment, by disconnection of the battery and protection of exposed terminals); and

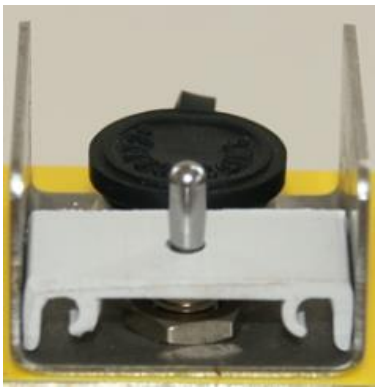
(b) unintentional activation

The words “Not Restricted” and the Special Provision number must be included in the description of the substance on the Air Waybill as required by 8.2.6, when an Air Waybill is issued.

The batteries used in the FEC LED Helipad Light have been qualified by the manufacturer to be compliant with this provision.

To prepare light units for carriage by air:

- Turn all of the power switches to their central off position
- Fit the white switch keepers as shown in the photo to the right



Restoring the lights units after Flight:

- Remove the switch keepers and retain for future use

30. Packaging and Labelling

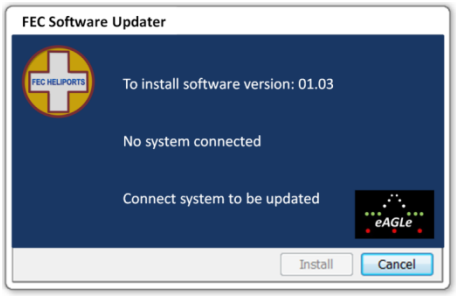
Repack the lights in the case and fit the case into its original bubble wrap and inner cardboard box. Attach a warning label to the inner box.

Fit the inner box into the outer protective cardboard box with foam liner. Attach another warning label to the outer box.

A sample label is included on the CD for you to enter your contact details onto.

31. Software Updater - HeliLights

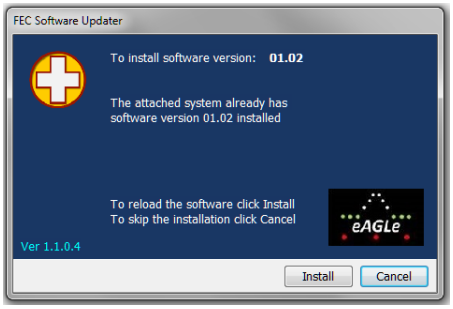
The FEC HeliLights (V4.x onwards) can be updated with new software by users. Software updates are available as downloads from the FEC website. Two formats are supported; executable (.exe) and self-extracting zip files. If your PC firewall prevents downloading of the .exe file, download and extract the zip file version.

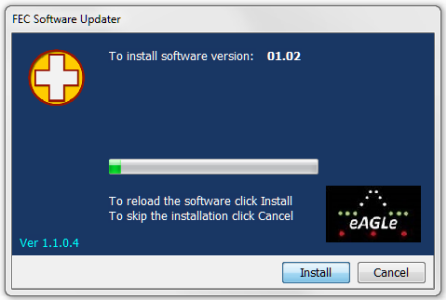


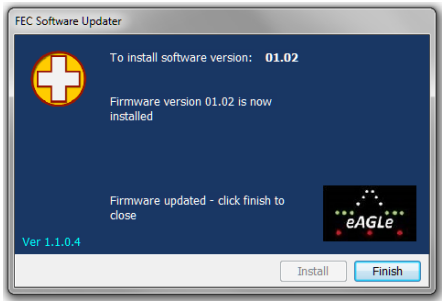
To update the software requires a Windows PC and a USB cable with type 'A' plug one end and **Mini** type 'B' the other. The installer requires neither software nor drivers to be installed on your PC – the standard Windows HID drivers already installed are used.

To update the software:

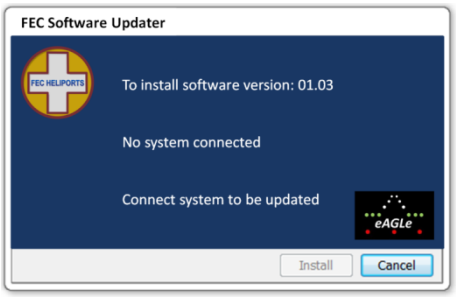
1) Turn the HeliLight unit off
2) Open the enclosure as described in earlier section
3) Connect the USB cable to the PC (not yet to the HeliLight)
4) Double click on the update file and a screen similar to that to the top-right will appear
5) Hold down the Boot-loader switch at the same time as connecting to the USB port on the bottom left of the PCB (image right) – this will power the HeliLight from the PC
6) All battery status LEDs should be lit indicating the HeliLight is ready to receive the new code
    - If the battery status LEDs are not lit, remove the cable from the light and repeat from instruction 5
7) The screen on the PC should now advise that the system is connected and the Install button will have changed from greyed-out to active.
    - If screen does not confirm it is ready to install, remove the cable from the HeliLight and repeat from instruction 5
8) Click Install and the software will be automatically uploaded to the HeliLight
9) A screen (right) confirms the update in progress
10) When complete:
    - The battery status LEDs will go out and the Blue Wireless Mode LED light
    - The PC Window will advise it is finished – click finish and the window will close
11) If Windows asks if the programme installed ok – click yes
12) Disconnect the USB cable
13) Reassemble the controller and turn on
14) The HeliLight will now be running the new software





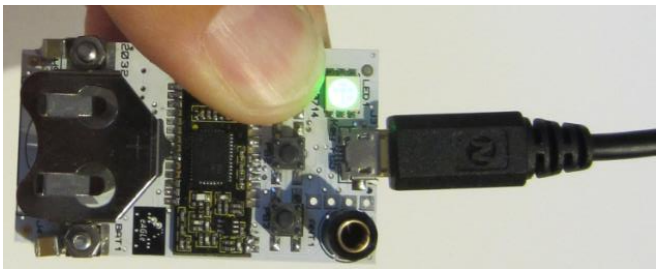


32. Software Updater – Key Fob Controller



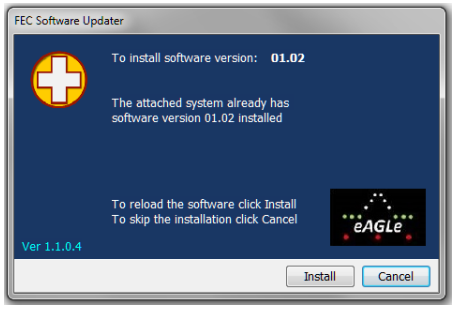
The FEC Key Fob Controller (KFC) can be updated with new software by users. Software updates are available as downloads from the FEC website. Two formats are supported; executable (.exe) and self-extracting zip files. If your PC firewall prevents downloading of the .exe file, download and extract the zip file version.

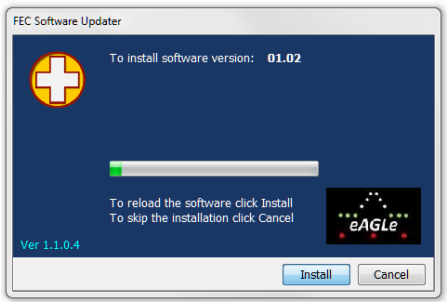
To update the software requires a Windows PC and a USB cable with type 'A' plug one end and **Micro** type 'B' the other. The installer requires neither software nor drivers to be installed on your PC – the standard Windows HID drivers already installed are used.

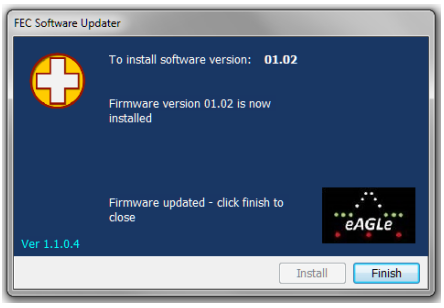


To update the software:

1) Open the Key Fob – Use a small flat blade screwdriver or similar
2) Remove the batteries with a ***non-metallic*** tool
3) Connect the USB cable to the PC (not yet to the Key Fob)
4) Double click on the update file and a screen similar to that to the top-right will appear
5) Hold down the left-most button at the same time as connecting to the USB port at the top of the PCB (image above right) – this will power the HeliLight from the PC
6) The Green LED should be lit (as in the photo) indicating the Key Fob is ready to receive the new code
    - If the Green LED is not lit, remove the cable from the light and repeat from instruction 5
7) The screen on the PC should now advise that the system is connected and the Install button will have changed from greyed-out to active.
    a. If screen does not confirm it is ready to install, remove the cable from the light and repeat from instruction 5
8) Click Install and the software will be automatically uploaded to the Key Fob
9) A screen (right) confirms the update in progress
10) When complete the LED will turn Blue – click finish and the window will close
11) If Windows asks if the programme installed ok – click yes
12) Disconnect the USB cable
13) Carefully observing the correct polarity, replace the batteries and reassemble the Key Fob
14) The Key Fob will now be running the new software







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